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Measurements of laser imprint in a thin foil using an x-ray laser for XUV radiography*

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For direct drive ICF, a capsule is imploded by directly illuminating the surface with laser light. Beam smoothing and uniformity of illumination affect the seeding of instabilities at the ablation front. We have used an x-ray laser backlighter to measure the imprinted modulation in a thin foil by XUV radiography. We use multilayer XUV optics to image the foil modulation in optical depth onto a CCD camera. This technique allows us to measure small fractional variations in the foil thickness. We measured the modulation due to imprint and subsequent Rayleigh-Taylor growth due to a low intensity 0.35 μm drive beam incident on a 3 μm Si foil using an yttrium x-ray laser on Nova. We used a similar technique to measure the imprinted modulation and growth due to a low intensity 0.53 μm drive beam incident on a 2 μm Al foil using a germanium x-ray laser at the Vulcan facility. We present measurements of the modulation due to static RPP and SSD smoothed speckle patterns at both 0.35 μm and 0.53 μm irradiation. We also present measurements using ISI smoothing, as well as results from two overlapping beam speckle patterns at 0.53 μm irradiation. We compare the results with the modulation due to a single mode optical imprint at 15-30 μm wavelength generated by a narrow slit interference pattern at the thin foil target.

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